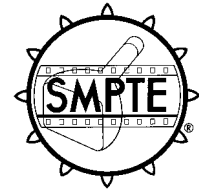


Care and Preservation of Audio Magnetic Recordings



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Introduction

Audio magnetic recordings of continuing interest and importance exist on a variety of media types, with earlier records in the analog mode while more recent records may be either analog or digital. This recommended practice examines the hazards that may limit the useful life of such recordings and recommends storage practices to optimize their future performance.

1 Scope

Stability and preservation of audio magnetic recordings require attention to and precautions against all three of the following hazards: chemical degradation, physical distortion, and magnetic corruption. Analog and digital recordings are on media with the same susceptibilities to chemical degradation and physical distortion. They do respond somewhat differently to magnetic corruption effects, and this will be discussed. Recommendations are offered for minimizing each of these risks.

Useful and acceptable reproduction from records so preserved further demands that in the anticipated reproduction process there be conformance to the essentials of good practice. These essentials are also reviewed.

1.1 Storage time scales

This recommended practice specifies the desirable storage conditions for audio magnetic recordings of

continuing value, as they may remain in library or vault storage between periods of intermittent reproduction or duplication. Two categories of storage time are defined. The categories are in agreement with those defined by ANSI/NAPM IT9.11. [12]

1.1.1 Medium-term storage conditions: Storage conditions suitable for the preservation of recorded information for a minimum of ten years.

1.1.2 Extended-term storage conditions: Storage conditions suitable for the preservation of recorded information having permanent value.

2 Structure of magnetic media

In figure 1, the structural components that provide media integrity and performance are identified. While it is sometimes possible to combine the function of two components within a single physical entity, each of the functions is essential and must survive without failure.

For the media of interest in audio recording, both as a final audio release and as audio recorded or presented in conjunction with images, many compositions of these structural components are encountered. Figure 2 identifies most of those found in archives, along with those employed in the recordings on current media.

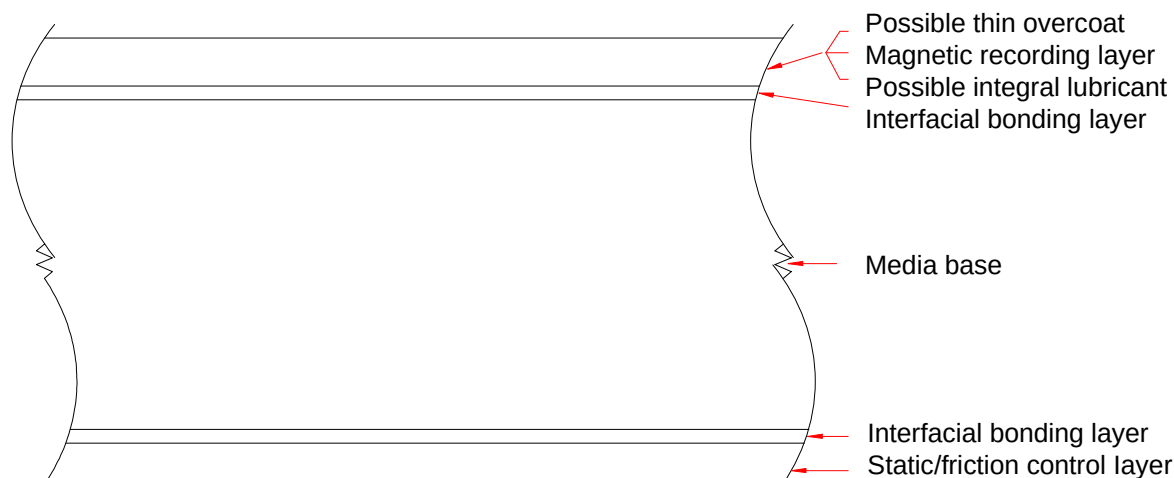


Figure 1 – Cross section of magnetic recording media (schematic)

Format	Nominal total thickness		Magnetic medium					
	Mils	Microns	Oxide, standard base	Oxide, medium base	Chrome, dioxide	Oxide, high bias	Metallix particle	Metallic film
<u>Tape:</u>								
Polyvinyl	2.5	63	*					
Acetate	1.4	36	*	*	*		*	
Acetate	2.0	51	*	*	*		*	
Polyester	1.3–1.5	33–38	*	*	*	*	*	
Polyester	1.9–2.2	48–56	*	*	*	*	*	
<u>Audio cassettes:</u>								
Polyester	0.4–0.6	10–15	*	*	*		*	*
Polyester	0.7–1.2	18–30	*	*	*		*	*
<u>Full-coat magnetic film:</u>								
Acetate	5.6	142	*	*				
Polyester	3.6–3.8	91–96	*	*				
Polyester	5.6–5.7	142–145	*	*				
<u>Striped magnetic film:</u>								
Acetate	5.6–6.3	142–160	*	*				
Polyester	5.4	137	*	*				
<u>Striped composite prints:</u>								
Acetate	6.8	173	*					
Polyester	5.9	150	*					

**Figure 2 – Diversity of analog audio magnetic records
(Application and storage procedures need to be tailored to the format)**

3 Summation of storage recommendations

	Medium-term	Extended-term
Equilibrium temperature °C	23 max	20 max
Equilibrium relative humidity %	20-45	20-30
Alternate 1: Temp	—	15 max
Alternate 1: R.H.	—	20-40
Alternate 2: Temp		10 max
Alternate 2: R.H.		20-50
Physical status: Winding Enclosure Orientation	Co-planar Protective Vertical	Co-planar Protective Vertical
External magnetic field:		
dc: $0e$	50 max	50 max
ac: $0e$	10 max	10 max

4 Derivation of recommended storage conditions

Temperature and humidity atmospheric conditions for magnetic media storage are summarized and tabulated in clause 3. The values have been derived from the extensive practical experience with photographic films, as recommended by ANSI/NAPM IT9.11 [12] for the minimization of various chemical degradations in monochrome photographic films. Most of the same polymers and modifiers are the major components of magnetic media. Therefore, the environmental recommendations for the minimization of chemical degradation during the storage of audio magnetic records have been derived from ANSI/NAPM IT9.11, modified only slightly by applying specific experience with magnetic records. [13]

4.1 Application of the recommendations of clause 3

4.1.1 Cycling of temperature and/or humidity increases the severity of the storage conditions and should be minimized.

4.1.2 Control of air-entrained and gaseous impurities as recommended by ANSI/NAPM IT9.11 for photographic films is equally applicable to magnetic media and, therefore, recommended.

Gaseous impurities: sulfur compounds, acidic vapors, ozone, peroxides, nitrogen oxides, ammonia, etc., are observed to accelerate chemical degradation.

Dust and air-entrained solid particles contribute to dirt and debris, and occasionally may be reactive.

4.1.3 Audio magnetic recordings may exist in cassette form, with the media already enclosed by the shell of the cassette. Media in roll form should be placed in a protective enclosure, selected from one of the following compositions: coated steel, aluminum, polyester plastic, polyethylene or polypropylene plastic, or acid-free paperboard, meeting ANSI IT9.2. [20]

4.1.4 It is preferable for magnetic media to be stored with the rolls in vertical orientation. If the media is not on a substantial reel, or within a cassette, the rolls should be supported by their hubs to eliminate asymmetric pressures on the rolls.

4.2 Moisture content and temperature of the media

All of the studies on chemical stability confirm that it is the precise moisture content and temperature of the actual media that controls, not the moisture content and temperature of the surrounding environment.

4.2.1 It must be recognized that a compact roll of tape or film can achieve temperature equilibrium with its environment rather quickly, but can achieve moisture equilibrium only by molecular diffusion of moisture into or out of the face of the roll, all the way to the midplane of the tape or film, which can be agonizingly slow. [19]

4.2.2 Media storage should be in a protective enclosure or in a cassette. Such enclosed recordings will require even more time to achieve a different equilibrium relative humidity.

4.2.3 Actual media moisture content: During the generation and prior history of the audio magnetic recordings, there may have been significant exposure to higher humidities and some equilibrium expedited by multiple transporting, as in a reproducer. Recognizing the very slow rates of moisture equilibration in media rolls not in active use, 4.2.1 predicts that any magnetic media which may enter a storage vault of lower humidity than the equivalent relative